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ABSTRACT

This paper (1) describes 4-year efforts of the Eastern Regional Institute for Education (ERIE) to promote use of various process-oriented curricula in over 50 New York State and Pennsylvania school districts; and (2) presents guidelines for curriculum installers based on documented successes and failures in participating schools. (Author/LLR)

Overview of a Systematic Effort to Engineer and Monitor

Curriculum Change: Emerging Guidelines and Encouraging Findings

for Curriculum Installers

(Paper presented at the annual meeting of the American Educational
Research Association, New York, New York, February 6, 1971)

by

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Curriculum Installation Defined

Throughout this paper "curriculum installation" is employed to mean: The planned introduction of process promoting instructional programs into collaborating elementary schools with explicit expectations that the program (1) will be taught on a regularly scheduled basis, (2) will be taught to promote teacher and pupil behaviors congruent with the inquiry goals of process education, (3) will be demonstrated to educators in the subregion by the collaborating school, (4) will diffuse to other elementary schools, (5) ultimately will be supported and maintained fully with local district resources, and (6) will remain the accepted and routinely used instructional program of the school until another curriculum with greater potential for meeting district needs has been systematically identified and introduced.

Strategies to Promote Process-Oriented Education

Since 1966, the Eastern Regional Institute for Education (ERIE) has intensely and pragmatically sought to promote widespread use of various process-oriented and inquiry-oriented curricula in elementary schools (Cole, 1970a). The rich learning activities, interest-capturing equipment, participative experiences, enduring coping skills, and open-ended questions that characterize process-oriented curricula have made each installation an "innovation" in the minds of public school practitioners. To date, ERIE has collaborated directly with 52 school districts, 53 elementary schools, and over 700 teachers and principals to bring Science--A Process Approach instruction to approximately 27,000 students (Mahan, 1970a). A parallel effort with 30 school districts and 200 teachers has made it possible for 7000 students to receive Man: A Course of Study instruction (Herlihy & Herlihy, 1970).

In 1967, the science curriculum was installed in 21 pilot schools via a strategy synthesized from educational change literature. A second science

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installation in 32 schools during 1969 was governed by a modified strategy reflecting the field realities and mis-assumptions detected in the first installation effort (Mahan, 1970b). Man: A Course of Study was introduced into elementary schools in 1969 via a third, and distinctive, university campus school based strategy for curriculum installation (Herlihy and Cole, 1971).

ERIE installation strategies have been validated on a most relevant testing ground - the classrooms where pupils do or do not encounter the changes a strategy purports to operationalize. ERIE personnel long have been on-site observers of the process that constitutes the adoption of an innovative program. This paper has been drawn from first-hand, day-by-day involvement in the difficult task of engineering enthusiastic, effective daily use of innovative curricula. It deals with tested strategies for curriculum change - strategies that have affected significantly the instruction of children.

Purposes of This Paper

The author desires to share with the educational community certain experience and insights gained during three years of science curriculum installation. Many findings and guidelines have emerged from the comprehensive ERIE undertaking (Mahan, 1971a). These guidelines, findings, and danger signals are now influencing the choice of future ERIE installation procedures. From an analysis of past installations, ERIE has been able to generate successively more effective school interventions. Hopefully, others will use these emerging field conclusions for the same purpose.

Few educators have had the same opportunity as ERIE to validate curriculum installation assumptions widely in the field. The case study derived findings and guidelines in this paper should stimulate concern and dialogue during the

strategy mapping phase of a curriculum change campaign. ERIE's experience can forewarn change agents of possible (probable) problem areas. It implies that many of the literature's recurring caveats for change just do not work--perhaps were never tested inside schools. The paper encourages change agents to leave their offices and enter their client schools to ascertain the quantity and quality of curriculum utilization, and to meet head on the "brass-tacks" variables influencing that utilization.

The reader is urged to undertake school centered curriculum change missions. Successful introductions of process-oriented curricula are very possible, very demanding, and very "messy" (Cole, 1970b; Goodlad, 1969). Little will happen as a result of speeches, articles, and exhortations. Work on the part of curriculum proponents is needed--longitudinal work "out there" in the presence of teachers and pupils. If a task-oriented installation strategy steadfastly is implemented by a task-oriented change agent(s), the prognosis for externally stimulated curriculum change is excellent. The guidelines and findings to follow provide would-be installers with important pre-visions of installation challenges that must be surmounted.

Skeltons of Two Science Curriculum Installation Strategies

ERIE's approach to curriculum installation, although eclectic, has been primarily rational-empirical. The writings of Clark and Guba (1967), Rogers (1962), and Brickell (1961) have all prompted the inclusion of various components of the installation plan. Curriculum introduction and diffusion activities generally have resembled Roger's (1962) five stages required for the adoption of an innovation. Collaborating schools studied descriptive brochures, heard presentations, and examined materials at "Dissemination Days" during what Rogers calls the awareness stage, while on-site "Demonstration Days" provided credible examination opportunities during the interest stage.

Cost information, commercial vendor inputs, telephone counsel, and further descriptive information were provided during the evaluation stage, as was a critical workshop experience for teachers and principals. The initial installation year, complete with consultant service and other supportive assistance from ERIE, constituted the trial stage. Finally, in the adoption stage, the verification of actual curriculum implementation coupled with assessment of student achievement determined whether or not the local district would retain the program. Adopting schools are now used as demonstration/diffusion centers in which other interested schools can be processed through the same five stages to realize a regional "multiplier" effect.

ERIE presently is collaborating to install Science - A Process Approach for the fourth consecutive year with pilot schools and for the second consecutive year with demonstration schools. The demonstration school installation strategy was built upon the triumphs and tragedies of the original pilot school strategy. Data for 1969-1970 revealed that demonstration schools were superior installers, teaching more science exercises on a more regular basis. Various strategy modifications paid off (Mahan 1970b). A majority of the guidelines for curriculum installers now in press (Mahan, 1971a) are based upon the improved curriculum utilization that resulted when more structure and more task-oriented procedures were incorporated into the demonstration school installation plan. Since the following selected findings and guidelines often evolved from contrasting performances of the two school networks, certain variations in strategy are indicated in Table 1.

Table 1

**Major Differences in Installation Strategies Between
Pilot and Demonstration Schools**

Components of Strategy	Pilot Schools N = 21	Demonstration Schools N = 32
Fiscal Subsidization	100% support from ERIE	45% support from state education agencies. 55% support from local district.
Selection of Collaborating schools	Friendship and politics influenced selection by ERIE personnel.	Independent selection by state education agencies based on school need and desire.
Examination of proposed curriculum	Administrators accepted a "free" program with little pre-examination. Teachers were meagerly informed.	Teachers and principals attended demonstration days, read literature, attended an orientation session prior to decision to participate.
Teacher Compensation	Provided by ERIE	Provided by local district.
Inservice Education	Only teachers participated, little focus on teaching methodology.	Principals required to participate with teachers, major focus on teaching methodology.
Consultant Service	Unstructured, un-defined consultant service by ERIE consultants who experienced no common preparation program and avoided classroom entry.	Structured, clearly defined consultant service by a cadre of professor-consultants especially prepared to render supportive assistance inside classrooms (Brown, 1970).
Installation goals	No installation quantity and quality goals established until the second year.	Explicit goals for quantity and quality established prior to school application to participate.
Roles and Responsibilities of Participants	None established.	Specific roles and responsibilities for each participant and each agency accepted in advance. Emphasis placed on the role of the principal as a facilitator of innovation.
Progress Feedback	No "scorekeeping" on degree of curriculum usage until middle of second year.	"Scorekeeping" on degree of curriculum usage from beginning. Progress conferences and faculty review sessions.
Continuing Problem Solving	Workshops with the principals of the pilot schools. No special assistance to augment consultant visits.	Workshops with principals and teachers of demonstration schools. Special assistance from ERIE staff members.

Table 1 (continued)

Components of Strategy	Pilot Schools N = 21	Demonstration Schools N = 32
Commitment to Addition- al Process-oriented Curricula	No commitment. Very lim- ited introduction of other process curricula.	Pre-commitment to introduce additional process curricula annually. Commitment honored in 1970-71.
Scope of Installation	Grades K-3 in 1967-68 Grade 4 in 1968-69 Grade 5 in 1969-70	Grades K-2 in 1969-70 Grade 3 in 1970-71

Contrasting Installation Results

Demonstration school personnel taught 90% of the Science - A Process Approach exercises during the first installation year, while pilot school personnel taught only 50% of the exercises during their initial year. Those demonstration schools which utilized the curriculum the least in 1969-70 exceeded the average utilization for pilot schools in 1967-68. In fact, demonstration schools taught more science in their first year than pilot schools taught in their third year of installation. Teachers in demonstration schools spent far more time interacting with consultants and welcomed consultant observation and follow-up conferences. It was a practice in demonstration schools to be teaching science when the consultant arrived. Attitudinal surveys revealed more positive feelings on the part of teachers and administrators of demonstration schools toward the science program, ERIE, consultants, the provision of research data, and the installation strategy. Consultants rated most demonstration school teachers as using inquiry-oriented teaching styles. Such ratings, for two years, generally were unavailable in pilot schools where consultants observed less and frequently found teachers not teaching science on consultant visitation day. For two years, dependent pilot school principals directed a ceaseless flow of requests, concerns, complaints, and questions to the ERIE office. Demon-

stration schools, led by the principal, internally solved their own routine problems of installation, rarely routing any aggravations to ERIE. Equipment management in demonstration schools was effective and timely; in the pilot schools the attitude tended to be "let someone from ERIE straighten it out." Plans for articulating the science experiences in a continuous fashion from grade-to-grade were made cooperatively during the first year by demonstration school principals and teachers. Pilot schools, while implementing the curriculum irregularly, ignored the articulation problem for two full years.

Emerging Guidelines for Curriculum Installers

Guidelines derived from case study are needed for initiating, supporting, monitoring, and sustaining curriculum installations if new curricula are to be more rapidly and more effectively utilized by the nation's schools. However, highly scientific and uncontestable guidelines are likely to remain unformulated. Schools are dynamic, changing, inconsistent, compromising, adapting, rather unpredictable institutions. Innovative curricula are always introduced into aexperimental settings--which change during the installation period! Hence, control conditions cannot be established and vigorously maintained during the life of a curriculum installation. Teachers, principals, and change agents, simply will do "their own thing" too much of the time. There would be no collaborative curriculum installations if school personnel had no options except to follow a "tight" research design.

Illuminating data and major trends can be identified, however, despite the aexperimental nature of curriculum installation. On-the-job installers can easily observe what does or does not work. The following selected guidelines,

augmented by others (Mahan, 1971a; Harty and Mahan, 1970) will strongly shape future installation endeavors of the author. Pertinent observations and data, illustrative of the experimental support for the guidelines, are cited. Extensive, varied sources of relevant case study data are listed in Appendix A.

Preparing for the Introduction of an Innovative Curriculum

Guideline #1: Begin a collaborative curriculum installation only after specific written agreements clearly describing participant roles and responsibilities are accepted by all collaborators.

Demonstration schools functioned within a framework of roles and responsibilities. Pilot schools did not. Demonstration schools were superior installers. They independently solved problems, originated fewer gripes, scheduled more faculty assessments of installation, made fewer telephone pleas to ERIE, and used local district specialists more effectively. Demonstration school principals (N=32) rated installation roles and responsibilities as an "absolutely necessary" component of an installation strategy.

Guideline #2: Construct a strategy for curriculum installation, complete with distinct components and approximate implementation dates, and follow the strategy from the start. Do not attempt a "we'll work it all out as we go along" approach.

Although there was a general strategy for the pilot school installation, school personnel were told that much would be worked out as installation progressed. The strategy was constantly compromised to keep participants happy. Things are still being worked out, using much agency time and energy, in pilot schools. Demonstration school personnel accepted an installation strategy, followed it step-by-step, and achieved first-year goals easily. Demonstration schools planned their activities around the strategy, eliminating debate and compromise, and using that time to attack local installation problems. Administration time required for the demonstration network was one-fourth the administration time invested in the loosely planned pilot network effort.

Guideline #3: Require school districts to invest a substantial percentage of local funds in a collaborative curriculum installation. Avoid bestowing "free" programs upon schools.

Demonstration school districts paid 55% of the installation costs during the first year and approximately 80% for the second year. Personnel in these districts evaluated the program implementation, closely monitored equipment provision, established local district objectives, and continually referred to the undertaking as "our installation." Pilot school personnel invested no funds in the installation, waited for ERIE to worry about its success, and referred to the undertaking as "ERIE's installation." Local commitment clearly followed local money. Central office administrators in demonstration districts generally were more familiar with the program, its characteristics and costs, because they had to convince their school boards to "buy it" rather than "receive it."

Guideline #4: Verify that teachers scheduled for involvement in a curriculum installation effort did personally volunteer to participate. Many teachers are "volunteered" by administrators eager to obtain subsidies from external agencies.

In four of the six pilot schools judged as the least successful installers, teachers reported that they had no opportunity to accept or reject the program. One of these four schools discontinued the installation after one month of controversy. On a 1970 survey, 38% of all pilot school teachers characterized the innovative curriculum as "introduced by administration," not as "introduced by teachers." Approximately 15% of the demonstration school teachers were non-volunteers, tending to totally reject the curriculum or to teach little of it.

Guideline #5: Assist teachers and principals to examine competing (alternative) instructional programs before accepting a school administrator's official application to implement the agency promoted program. A curriculum must be selected because it meets local needs, not because it is subsidized.

Pilot school teachers did not examine Science - A Process Approach, nor competing programs. Demonstration school personnel examined Science - A Process Approach. However, 28 of 34 teacher representatives to the orientation meeting for Demonstration schools reported that they had examined no other curricula. Only 3 of 34 teachers were

able to list two desirable and two undesirable characteristics of any innovative science curriculum. Yet, ERIE is detecting increasing indications that certain attitudinal and personality traits of teachers are related to more successful utilization of structured curricula, and that other traits relate more favorably to unstructured curricula (Andrulis, 1970; Andrulis, 1971).

Guideline #6: Help school personnel reach agreement on the status of any previous curricular program, so that there will be no false assumptions concerning the instructional time, priorities, equipment, and available space for the proposed innovative program.

A demonstration school base line data survey revealed that teachers averaged 13 to 18 minutes per day teaching science, as compared with the administrator's assumption of 21 to 29 minutes per day. When asked to describe the type of elementary science program in local use, principals, teachers, and superintendents differed significantly in their descriptions. On the survey, teachers recorded 52 installation concerns, principals recorded 33, and superintendents recorded one. It is untenable to assume that a new curriculum easily will replace an old curriculum if the old curriculum was used spasmodically or not at all. Pre-installation conditions must be examined; they constitute the environment in which the new program must take root.

Guideline #7: Do not attempt a curriculum installation unless curriculum guides (software) and all required equipment (hardware) are available to teachers at the beginning of the school year. Equipment "foraging" and "creating" activities should be avoided.

During 1968-69 the installation director received over 200 pilot school telephone calls complaining about equipment delivery problems. Consultants and school personnel consistently rated late equipment provision a major impediment to installation success. Fourth grade pilot teachers averaged teaching 1.7 science exercises in 18 weeks while awaiting equipment delivery. A year later, with equipment, they averaged teaching 7.5 exercises in the same time period. The equipment provision component of the ERIE installation strategy consistently received a low rating. The three demonstration schools who experienced equipment disorders and fouled deliveries in 1969-70 trailed the other 29 schools in average exercises taught throughout the entire year.

Guideline #8: Provide an intensive inservice workshop in the innovative curriculum for participating teachers and principals.

Pilot teachers on pre- and post-workshop surveys ranked the inservice education workshop as the most important resource for implementing curriculum change. At the conclusion of their initial installation year, a random sample of demonstration school teachers rated the inservice education workshop as "absolutely necessary" for curriculum installation. Participating teachers who did not attend the workshops lacked confidence, were apprehensive, and requested special consultant assistance (Mahan, 1971c). Demonstration school teachers indicated on a survey that principals "definitely should attend inservice workshops with teachers."

Supporting and Monitoring a Curriculum Installation

Guideline #9: Employ a structured, classroom based, task-oriented type of consultant service to collaborating schools to insure effective consultant utilization.

Consultant service for the pilot school installation was non-directive, passive, on-call, and teacher-lounge based. For the demonstration schools, consultant service was task-oriented, structured, formally scheduled, and classroom based. Pilot school consultants during two years averaged one demonstration teaching session per each three full consulting days and one observation of teaching per each full consulting day. Demonstration school consultants raised each of these ratios by a factor of three in their first year of service, as did pilot school consultants during 1969-70 after the approach to consultant service was modified. A summary of the classifications of the first four questions asked by pilot teachers of their consultant on each visit revealed that under unstructured consulting 48% of the queries were non-task oriented, and only 5% were requests for demonstration. Under structured consulting, non-task oriented queries dropped to 32% while requests for demonstration increased to 11%. Requests for evaluation of instruction likewise rose under structured consulting. "We shall enter your rooms only when invited" consultant service clearly resulted in very few invitations to observe teaching or to assist teachers (Mahan, 1970c).

Guideline #10: Assign to collaborating schools consultants who know the curriculum, including its software, hardware, psychological undergirdings; and who can actually teach it to children. A group process expert is not necessarily an effective curriculum consultant. Likewise, school personnel will not necessarily accept someone as a curriculum expert simply on the basis of his process skills.

Five pilot schools received consultants who were skilled in group processes and intent on helping school personnel "work through their problems." One of the schools forced removal of the consultant, two refused a second year of consultant service, and two demanded an exchange of consultants. These schools, with five others, told site visitors that they desired and needed more active consultants who were capable of operationalizing the innovative instruction - who could "do" rather than discuss. Two of the demonstration schools also requested the replacement of consultants who could not teach curricular units.

Guideline #11: Enroll two or more teachers per each grade level within each innovating school engaged in a curriculum installation effort. The challenge of change is better accepted when shared among teachers.

In four pilot schools only one teacher participated in the installation at one or more grade levels. These four schools were rated in the bottom third relative to installation success. One additional school had only one participating teacher per grade level. It rejected the installation after one month. In a 1969-70 survey, 517 pilot and demonstration teachers rated the assistance of fellow teachers almost as valuable as the basic guidance provided by the curriculum syllabus, and nearly equivalent to the assistance inherent in the preparatory workshops. A teacher leader study confirmed the value of peer support to innovating teachers (Buddle, Mahan, Wallace, 1970).

Guideline #12: Insist that schools make formal provision for periodic, planned faculty assessment of curriculum implementation and resulting student achievement. Do not assume that a meaningful analysis of an on-going innovative effort will occur automatically.

Fourteen of 21 pilot principals indicated in surveys that no faculty meetings concerning installation goals, goal achievement, instructional time parameters, or student achievement had been held during 1968-69. At the end of that year, 70% of the pilot teachers reported no participation in faculty assessment of the innovative program. Pilot school personnel made no plans to articulate learning exercises from grade-to-grade during the first two installation years.

Guideline #13: Include the central office subject matter specialist (supervisor) in the planning, selecting, preparing, implementing, and evaluating phases of curriculum installation. Do not limit contact exclusively to principals and teachers.

In five of seven pilot schools where the most extensive diffusion of the science programs to other schools occurred, science supervisors performed most leadership and coordinative functions. ERIE erred seriously in overlooking the science supervisors in 1967. Conversely in the demonstration school effort, ERIE worked through science supervisors as well as through principals. Much more support was received from demonstration district supervisors. By-passing the supervisor tended to make the pilot installation "ERIE's worry." A 1968 survey revealed that elementary teachers rate subject supervisors equal to principals as initiators of curricular innovations (Mahan, 1970e).

Guideline #14: Expect schools with relatively low instructional expenditure per pupil to be successful collaborators in implementing new curricula and in demonstrating the functioning curricula to others. Enriched and widely publicized districts are not necessarily the most effective implementors of innovations.

A negative correlation ($r = -.57$, $p=.05$) existed between the rankings of 21 pilot schools according to degree of installation success at the end of 1968-69 and the total fiscal expenditure per pupil in each district. Similar correlations were identified at the conclusion of 1967-68, including $-.67$ ($p=.05$) correlation between per pupil expenditure and teacher attitude toward the innovative curriculum (Andrulis, 1970).

Guideline #15: Provide participating teachers with live or filmed models of the instructional methodology as prescribed by the developers of the new curricula. In the absence of observable criterion behavior, all teaching tends to be considered as "appropriate" and "good."

Pilot teachers generally resisted interaction with consultants over the use of the non-didactic teaching behavior envisioned to accompany Science - A Process Approach. Site visitors to pilot schools in 1968-69 reported that up to 50% of the participating teachers were using traditional, didactic classroom procedures. Teachers commented that they had always used a process approach and that this curriculum required no modification of their teaching behavior - that only content revisions were necessary. The teachers tended to feel that they were skilled in a methodology they actually had not witnessed. No pilot schools had films or video tapes of process - science instruction. Rarely were consultants asked to do demonstration teaching focusing on teaching style. No interaction analysis devices have been used voluntarily by participating teachers to examine and modify teaching behaviors. Demonstration school teachers witnessed demonstration

teaching in workshops and agreed to schedule consultants to do demonstration teaching. Many demonstration schools made video tapes and exchanged them in the schools. Consultants and site visitors rated teacher use of process behaviors as occurring more often in the demonstration schools during the initial installation year than had been the case in pilot schools during their initial year.

Guideline #16: Make continuous score-keeping on the actual utilization of an innovative curriculum in each classroom a key component of any installation strategy. The success of a curriculum installation strategy rests upon the degree to which pupils regularly experience the curriculum, and not upon myths, attitudes, verbal claims, and undocumented publicity. First establish the degree to which a program was uniformly implemented before attempting to assess its impact upon students. Children are not likely to learn what they are not taught.

Pilot schools, under a 1967-68 policy of no feedback on the amount of the curriculum taught, completed an average of 50% of the sequential science exercises. Schools that taught less than 30% of the yearly syllabus were rated as successful installers by their principals. Even ERIE consultants attempted to rationalize success out of 20 to 30 minutes of science instruction per week and five or six exercises per year. When a hard-nosed, periodic instructional progress feedback system was initiated in the second year, pilot schools averaged teaching 70% of the curriculum and increased to 88% in the third year. School plans to articulate the curriculum were not made until formal progress reports were distributed to teachers and principals.

Demonstration schools began their installation effort with the understanding that they would receive frequent progress reports. They taught 90% of the science exercises in their first year. On a survey, 28 of 32 demonstration school principals rated the progress feedback component of the ERIE installation effort as "very effective." Only one principal rated it "ineffective."

Encouraging Findings for Curriculum Installers

Finding A: Schools and teachers that volunteer to engage in a collaborative curriculum installation with an external charge agency tend to remain as participants throughout full life of the project.

Through June, 1970, ERIE had involved 75 elementary schools in various curriculum change efforts. Only one school made an unscheduled termination of its installation. Less than 4% of the 800 teachers involved resigned as installation participants.

Finding B: There is a tendency for teachers to increase the instructional time devoted to the subject area represented by the innovative program as a result of systematic installation procedures.

Prior to the introduction of Science - A Process Approach pilot teachers reported spending an average of 67 minutes per week on science education; at the end of two installation years they reported spending 122 minutes per week on science education. Demonstration schools increased weekly science instruction time from a weekly mean of 77 minutes to 130 minutes during the initial installation year.

Finding C: Classroom utilization of an innovative curricula can be increased through continuous assessment of instructional progress and follow-up conferences with school staff.

Pilot schools increased the amount of the science curriculum taught from 50% in 1967-68 (science instruction twice per week) to about 83% in 1969-70 (science instruction approximately four times per week).

Finding D: Elementary school pupils are able to master the behavioral objectives specified for Science - A Process Approach.

Standardized competency measures were administered by each teacher to a random sample of pupils upon the completion of each science exercise. Pupils tended to answer the following percentage of all competency measure tasks correctly: Grade K = 81%; Grade 1 = 86%, Grade 2 = 84%, Grade 3 = 76%.

Finding E: Pilot and demonstration school teachers recorded strong positive attitudes toward the process-oriented curriculum.

Each science exercise was rated on a one through nine scale by each teacher who completed that exercise. One = completely dissatisfied with the exercise. Nine = completely satisfied. Pilot teachers gave the science exercises a mean rating of 6.95, demonstration school teachers compiled a mean rating of 7.20.

Finding F: Teachers do not identify conflict between the "skills emphasis" of a process-oriented science program and the "content emphasis" of the more traditional school curricula.

Pilot teachers rated on a one (no conflict) through nine (great conflict) scale the conflict between process emphasis and content emphasis. The mean rating was 1.9.

Finding G: School districts that enroll a single elementary school in a collaborative curriculum installation tend to expand the curricular program to other schools in the district.

In 16 of the 18 pilot districts eligible to expand the installation, expansion occurred. Thus 23,000 additional students received innovation instruction at no cost to ERIE. In 21 of 29 demonstration districts, the curriculum was expanded to other schools at the end of one year.

Finding H: After one year of curriculum installation, collaborating schools are willing to demonstrate new curricula in use and attract large audiences to publicized Demonstration Days.

Pilot schools conducted 34 curriculum demonstration days over a two year period, attracting 1,700 interested educators (Mahan, 1970f). Demonstration schools contracted to conduct 60 regional demonstration days in 1970-71.

Finding I: Systematic curriculum installation in a network of collaborating schools, accompanied by demonstration activities, is an effective way to diffuse an innovative curriculum.

The original ERIE installation brought process-oriented science education to 7,316 students in September, 1967. By June, 1970 the ERIE installation strategy and regional replications of that strategy resulted in 83,000 students receiving process-oriented science instruction. (There will be an acceleration of the diffusion process through several statewide inservice workshops planned for the summer of 1971.)

Finding J: Cadres of university professors can be prepared, coordinated, and employed as effective support personnel to classroom teachers engaged in curriculum installation.

With NSF support, ERIE prepared 50 professors to be classroom consultants. Thirty-seven of the professors served pilot and demonstration schools in 1969-70. School personnel requested that 35 of the 37 professors be reassigned to the same school in 1970-71. The most effective use of consultant time by teachers occurred after the cadre of trained professors assumed the consulting responsibility (Mahan, 1971d).

Installation in Retrospect

Curriculum installation is challenging. Most administrators experience difficulties in effecting an innovation within one school or even in two or three classrooms. Difficulties multiply rapidly when the new program is installed in many diverse schools located in widely separated districts. Curriculum installers must have a workable strategy for introducing, monitoring, and institutionalizing a new curriculum. Many do not.

Experience and field-visits indicate that the mere shipping of boxes of new instructional materials to schools in no way permits the recipient schools to be labeled as "curriculum installers." The choice of a sound conceptual foundation for an installation effort also means nothing until children are actually receiving the new instruction in the appropriate ways. Schools are relevant proving grounds for curriculum installers. The numerous and real problems in the schools must be faced by the installers. Theories of change must be pragmatically converted into scheduled, discrete, understandable, implementable and assessable steps which govern the installer's total collaboration with innovating schools. Presently, programs to guide installers are rare.

Educators willing to invest time and energy in curriculum change should work directly with schools instead of writing about school shortcomings and what schools should do. Perhaps the rational-empirical, power-coercive normative-re-educative, and knowledge linking curriculum change positions in the literature today outnumber the large, really effective, "in operation every day", curricular change undertakings. It is time to move change prescriptions from their conceptual state into a chronological sequence of task-oriented activities culminating in local district financial support of emergent curricula. Conceptualizations must be subjected to real-world tests. Those

who are willing to be working partners with school practitioners in installation activities can expect to witness exemplary educational change. These important activities include: (1) establishing governing conditions, (2) selecting the most appropriate curriculum, (3) preparing staff to use the curriculum, (4) providing teacher support mechanisms, (5) assessing the actual use of the curriculum, (6) measuring student achievement, (7) insuring inservice training for staff replacements, (8) managing curricular hardware and software, (9) appropriating sufficient fiscal resources, and (10) demonstrating the program to others.

Obviously, problems and frustrations encountered by ERIE during a three-year installation period are implicit in this paper - so are the successes! Guidelines and findings are presented in anticipation of serious consideration and validation. It is necessary that advocates of curriculum change enjoy greater success while neutralizing the omnipresent deterrents to installation. Advocates are encouraged to plan installation activities that meet head-on the problems that stimulated these guidelines. Don't dismiss the guidelines as an "everybody knows that" listing. We were there! We know that if everybody did what everybody supposedly knows, there would be fewer abused, misused, or mythical curriculum installations in elementary schools today.

Appendix A

Data Sources

Three years as a curriculum installer leads to in depth contacts with teachers, principals, and central office administrators who implement innovative curricula. Many visits to classrooms occur. There is abundant opportunity to administer student assessment devices, to collect survey data, to employ published scales, to participate in faculty meetings, and to record the frank communication between external change agents and internal installers. Continued association with schools permits a clear picture of curriculum utilization in those schools to emerge. Sources of ERIE data on curriculum installation are listed below. Many of the sources are "soft" or "experimental". However, all sources are real. They are important if one wants to know what school faculties actually do with new instructional products and how they feel about them. Data from these sources substantiate some popular installation procedures cited in the literature, while directly challenging others.

Table 2

Data Sources and Field Experiences

"Hard" Indicators	"Soft" Indicators
1. 53 schools, over 700 teachers and principals, over 27,000 students directly involved with an innovative curriculum.	1. Narrative reports by consultant following each consultant visit.
2. Over 50,000 additional students receiving process-science instruction via replication of the ERIE installation strategy by other agencies and schools.	2. Consultant rating of teacher use of process teaching behaviors.
	3. Participant telephone calls and correspondence to director of installation effort.

"Hard" Indicators	"Soft" Indicators
3. Rigorous verification of each exercise taught by each teacher.	4. Dozens of personal conferences with principals and teachers.
4. Thousands of competency measures used by teachers to assess pupil achievement and immediately forwarded to ERIE for analysis.	5. Teacher Evaluations of Inservice Workshops.
5. Classification of the Ways in Which Consultant Time is Used (Mahan, 1971b).	6. Teacher Attitudes Toward Consulting Activities.
6. Classification of the Types of Questions Teachers Ask of Consultants (Mahan, 1970c).	7. Site visit by independent ERIE team to collaborating schools (Harty, 1970).
7. Purdue Teacher Opinionnaire.	8. Site visits by professor-consultants to collaborating schools (Mahan and Mohan, 1970; Mahan 1970d).
8. Activities Index	9. Consultant Ranking of Schools According to Success Criteria.
9. Education Scale	10. Identification of Variables Hindering Installation by Consultants, Principals, Teachers, Director.
10. Organizational Climate Index	11. An Assortment of Unpublished scales on installation strategy, appropriateness of process-oriented science, time devoted to the curriculum, equipment suitability, pupil enthusiasm, desire to continue in the program, etc. administered to teachers annually.
11. Organizational Climate Description Questionnaire	12. Year-ending interviews with each teacher.
12. Otis Lennon Intelligence Test	13. Summaries of Problems Discussed during Follow-up Workshops.
13. Teacher Preference Scale	14. Unsolicited testimonials from teachers.
14. Record of Petty Cash Expenditures for Science Program.	15. Principal ratings of the success of his school's installation.
15. Record of Local Financial Investment in Installation Effort.	16. Informal reports on curriculum utilization by commercial supplier personnel.
16. Record of Extent of Expansion of Program to Other Schools in District.	
17. Record of Teacher Retention in the Program.	
18. Demographic Survey and Interviews by American Institute for Research.	
Record of Percentage of Return of Various Research Forms.	

"Hard" Indicators	"Soft" Indicators
20. Baseline Data Survey Prior to Installation.	17. Pupil enthusiasm for the curriculum experiences.
21. Demonstration Day Dates and Enrollments.	18. Director's Annual ranking of collaborative schools according to success criteria.
22. Site visits to campuses of professor-consultants.	19. Reports of Demonstration Day participants.
23. Porter's Instrument.	20. Comments of site visitors from state education departments.
24. Teacher attitude Toward Each Science Exercise Taught.	21. Newspaper publicity and lay interest.
25. Teacher Suggestions for Modification of Science Exercises.	22. Attitudes of personnel of Title III Regional Centers.
26. Video Tapes of Teachers Using the Curriculum.	23. Comparisons made with administrators of similar installations in non-ERIE affiliated schools.
27. Classroom Observation.	
28. Experience Planning and Implementing Eight State-Wide, Campus Based Workshops for Over 1,400 teachers.	
29. Consultant Use of The Software and Hardware of The Curriculum.	
30. Process Tests Administered to Pupils.	

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Note: Unpublished documents and working papers are not available for distribution but may be examined by interested scholars at ERIE.